

## ILLUMINATION KNOB AND METHOD OF MANUFACTURING KNOB

## FIELD OF THE INVENTION

The present invention relates to an illumination knob used at a  
5 controlling panel of a vehicle and to a method of manufacturing the knob.

## BACKGROUND OF THE INVENTION

Recently, as vehicles and various electronic apparatuses have been  
more functional and diversified, a switch provided on a control panel of each  
10 of them often has an illumination knob. For confirming and recognizing the  
position of the switch even in a dark, the illumination knob is illuminated by  
a luminous source provided in the control panel.

A conventional illumination knob will be described with reference to  
Fig. 4 through Fig. 5B.

15 Fig. 4 is a sectional view of the conventional illumination knob. Knob  
section 1 made of insulating resin has a pair of elastic pawls 1C formed at a  
lower surface of knob section 1. Pawls 1C protrude downward and have  
recesses 1B on respective inner surfaces of the pawls. Knob section 1 has  
opening 1A provided in its upper surface. Holder 2 has a substantially  
20 cylindrical shape and is made of insulating resin. Holder 2 has a pair of  
protrusions 2A formed on its outer surface, and the recesses 2A are latched  
on recesses 1B. Thus, holder 2 is attached at a lower section of knob section  
1. Display section 3A of an upper end of light-transmittable light guide unit  
3 is inserted into opening 1A of knob section 1. Light guide unit 3 has a pair  
25 of protrusions 3B provided at a lower end of unit 3, and the protrusions 3B  
are latched in holes 2B of a lower end of holder 2. Therefore, light guide  
unit 3 is accommodated and fixed in holder 2, thus providing the

illumination knob.

Figs. 5A and 5B are exploded sectional views of the conventional illumination knob. As shown in Fig. 5A, light guide unit 3 is inserted into holder 2 from underneath of holder 2 in a direction A. Then protrusions 3B  
5 at the lower end of light guide unit 3 are latched in holes 2B, thus combining holder 2 with light guide unit 3.

Next, as shown in Fig. 5B, holder 2 having light guide unit 3 inserted therein is inserted into knob section 1 from underneath section 1 in a direction B, and elastic pawls 1C elastically deforms in right and left  
10 directions. Then, recesses 1B are latched on protrusions 2A by elastic restoring force of elastic pawls 1C, thus combining holder 2 with the lower section of knob section 1 to provide the illumination knob.

This illumination knob is mounted at the switch provided on the control panel. When the luminous element, such as a light bulb or a light  
15 emitting diode, in the control panel emits light, the light is transmitted through light guide unit 3 and illuminates display section 3A inserted into opening 1A. This structure allows the position of knob section 1 to be confirmed and recognized even in a dark.

In the conventional illumination knob, knob section 1 holds holder 2  
20 and light guide unit 3 with elastic pawls 1C. When display section 3A of an upper surface of knob section 1 is pressed by strong force in a direction C, the force is transmitted from light guide unit 3 to holder 2. The force may make elastic pawls 1C open in right and left directions, thus unlatching protrusions 2A from recesses 1B. As a result, holder 2 and light guide unit 3  
25 may be fallen from knob section 1.

To prevent the falling, it is necessary to applying adhesive to recesses 1B and protrusions 2A or welding elastic pawls 1C of knob section 1 to holder

2. These operations make the illumination knob need a long time to manufacture and be expensive.

Another conventional illumination knob is disclosed in Japanese Patent Laid-Open Publication 8-207622.

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## SUMMARY OF THE INVENTION

An illumination knob includes a knob section having an opening formed therein and including an elastic pawl protruding from a periphery of the opening, a holder having a through-hole formed therein which is linked to  
10 the opening, and a light-transmittable light guide unit accommodated in the through-hole of the holder. The knob section includes an elastic pawl protruding from a periphery of the opening. The holder includes a holding section provided at an inner surface of the through-hole. The holding section contacts a surface of the elastic pawl which is opposite to the opening,  
15 and is being latched to the elastic pawl. The light guide unit sandwiches the elastic pawl with the inner surface of the through-hole and contacting the elastic pawl.

The illumination knob includes components held securely, thus being manufactured easily and being inexpensive.

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## BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a sectional view of an illumination knob in accordance with an exemplary embodiment of the present invention.

Figs. 2A and 2B are exploded sectional views of the illumination knob  
25 in accordance with the embodiment.

Fig. 3 is a sectional view of another illumination knob in accordance with the embodiment.

Fig. 4 is a sectional view of a conventional illumination knob.

Fig. 5 is an exploded sectional view of the conventional illumination knob.

## 5 DESCRIPTION OF THE PREFERRED EMBODIMENT

Fig. 1 is a sectional view of an illumination knob in accordance with an exemplary embodiment of the present invention. A dark-colored knob section 11 made of insulating resin, such as ABS or polycarbonate, has opening 11A shaped in a mark, character or letter formed in an upper surface of knob section 11. A pair of elastic pawls 11C protruding downward are formed at a lower surface of knob section 11, and have recesses 11B in their outer surface. Holder 12 having through-hole 12D has in a substantially cylindrical shape or a U-shape made of resin, such as polyacetal or poly (butylene terephthalate). Hole 12D is linked to opening 11A. Holding section 12A provided at an inner surface of hole 12D of an upper end of holder 12 contacts an outer surface of elastic pawl 11C. A pair of protrusions 12B formed at inner surfaces of holding sections 12A are latched in recesses 11B at an outer surface of elastic pawls 11C, thus combining holder 12 with a lower section of knob section 11. Light-transmittable light guide unit 13 made of insulating resin, such as acrylic or polycarbonate, is inserted into hole 12D of holder 12. Display section 13A of an upper end of light guide unit 13 is inserted into opening 11A of knob section 11. A pair of protrusions 13B of a lower end of light guide unit 13 are latched in hole 12C of a lower end of holder 12, thus accommodating and latching light guide unit 13 in holder 12. A surface of light guide unit 13 contacts inner surfaces of elastic pawls 11C protruding downward from a lower surface of knob section 11. As described, Pawl 11C for holding holder

12 is sandwiched between the surface of light guide unit 13 and holding section 12A, thus providing the illumination knob.

Next, a method of manufacturing the illumination knob will be described with reference to Figs. 2A and 2B. Figs. 2A and 2B are exploded  
5 sectional views of the illumination knob in accordance with the embodiment.

First, as shown in Fig. 2A, holder 12 is inserted into knob section 11 from underneath the section 11 in a direction D while allowing elastic pawls 11C to elastically deform inside by holding sections 12A. Then, recesses 11B are latched on protrusions 12B by elastic restoring force of elastic pawls  
10 11C, thus combining knob section 11 with holder 12.

Then, as shown in Fig. 2B, light guide unit 13 is inserted in hole 12D of holder 12 from underneath the holder 12 in a direction E. Elastic pawl 11C is sandwiched between an upper end of an outer surface of light guide unit 13 and holding sections 12A. Protrusions 13B at the lower end of light  
15 guide unit 13 are latched in holes 12C. Light guide unit 13 is accommodated and latched in holder 12, thus providing the illumination knob.

As shown in Fig. 1, even when force is applied to display section 13A at of an upper surface of knob section 11 in a direction F, elastic pawls 11C do  
20 not open in right and left directions. The reason is that elastic pawl 11C is sandwiched between the outer surface of light guide unit 13 and holding sections 12A. In a word, constituent components are securely held in the illumination knob and do not need to bond or weld, so that the illumination knob of the embodiment is manufactured easily and inexpensive.

25 Then, the illumination knob is mounted at a switch provided on a control panel. When a luminous element, such as a light bulb or a light emitting diode, in the control panel emits light, the light is transmitted

through light guide unit 13 and illuminates display section 13A inserted into opening 11A. The structure discussed above allows the position of the knob to be confirmed and recognized even in a dark.

Fig. 3 is a sectional view of another illumination knob in accordance with the embodiment. In this illumination knob, extending section 11D is provided outside elastic pawl 11C of the lower surface of knob section 11, and protrudes downward. An inner surface of extending section 11D contacts an outer surface of holder 12, which is opposite to holding sections 12A. Extending section 11D prevents holding sections 12A of holder 12 from deforming, thus holding the constituent components more securely.

According to the embodiment, recess 11B is formed in the outer surface of elastic pawl 11C, and protrusion 12B is formed at the inner surfaces of holding sections 12A. However, a protrusion may be formed at the outer surface of elastic pawl 11C and a recess, which is latched on the protrusion, may be formed in the inner surfaces of holding sections 12A. This structure provides the same effect.